Scenario ID	178-v2
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Reviewers	
Reviewed	
Accepted	
Goal	LHC beta beating analysis
Level	
Actors	Fermilab Beam Physicist LHC Beam Physicist LHC Operations Specialist
Trigger	Beta beating in the LHC is likely to be a key issue. One of the main reasons is the effect it has on the local aperture in the machine and for this reason tight limits on the acceptable level of beating are imposed. Analysis of the potential sources and their impact on the machine is required. Methods need to be developed to measure the beating, and to determine the error sources. These errors then need to be corrected, with measurements to confirm. The measurement and analysis techniques need to be tested with beam, and then used under varying operation conditions. Providing appropriate tools and analysis techniques would leverage Fermilab expertise to help solve a potentially serious problem.
Narrative	Offline: Fermilab specialist has to analyse the problem (liaison with LHC accelerator physicist, beam instrumentation specialist, controls system specialist) • Simulate problem • Develop analysis techniques based on foreseen multi-turn measurement • Develop analysis application using multi-turn data. Any tools developed are use standard LHC components: acquisition, data structures etc. • Simulate analysis of measurements. Introduce error sources into model. Attempt to identify sources. Propose corrections. These task will be performed outside of the LHC@FNAL control room. Online: • Data acquisition will involve exciting the beam in controlled situations during dedicated machine development periods. Planning required in liaison with LHC operations. During machine study time the measurement

	sequence is performed by LHC operations, supervised by FNAL@LHC. • Input parameters (bunch selection, tune values, excitation levels) will have to be adjusted to match beam conditions. Data quality to be monitored in order to adjust these properly. This will require FNAL@LHC having near instantaneous access to measured data to ascertain its quality and judge the necessary adjustment of parameters. • FNAL performs off-line analysis and suggests corrections. These corrections will be applied during a follow-up machine study to test results of predicted corrections. Adjustment of accelerator parameters made by LHC operation. Beta beating measurement sequence repeated. Iterations as necessary.
Exceptions	
Comments	Fairly complex measurement which will test remote integration. Development of tools and remote off-line analysis clearly involve remote specialist intimately with LHC operations, and at the same time give clear value added to central operations. Requirement: Remote access to LHC optics, errors, transfer functions etc. It agreed between CERN and Fermilab that LHC@FNAL has the required access to the appropriate repositories Requirement: On-line monitoring of all required machine parameters Requirement: Verbal/Visual link during machine studies. Requirement: All machine parameter changes to be published by CERN. FNAL@LHC to subscribe to these changes. Appropriate monitoring of changes at LHC@FNAL. Requirement: Access to software development environment. Requirement: Access to published accelerator data Requirement: Access to pre-defined measurement data structures, storage and access methods. Requirement: Access to on-line measurement repository